3.9 The Animal Kingdom

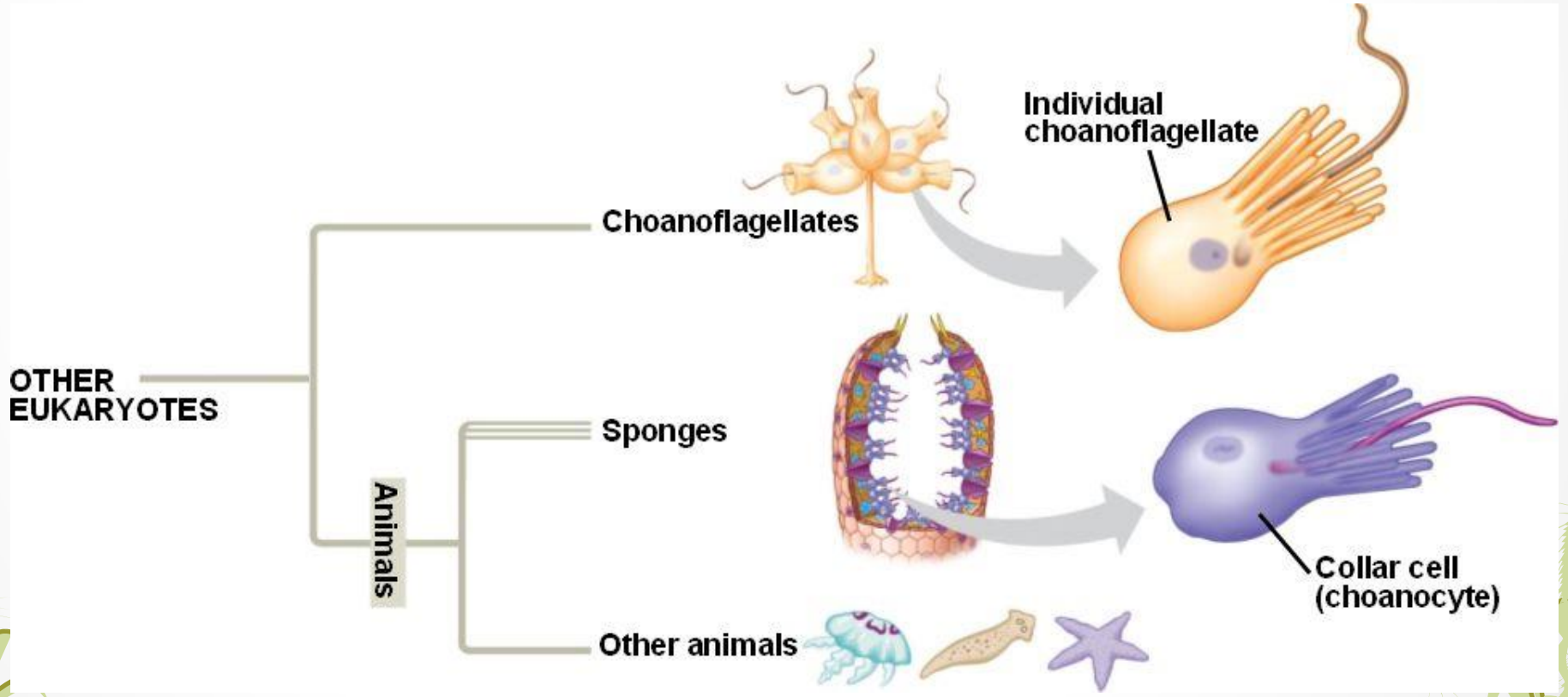
General Characterises

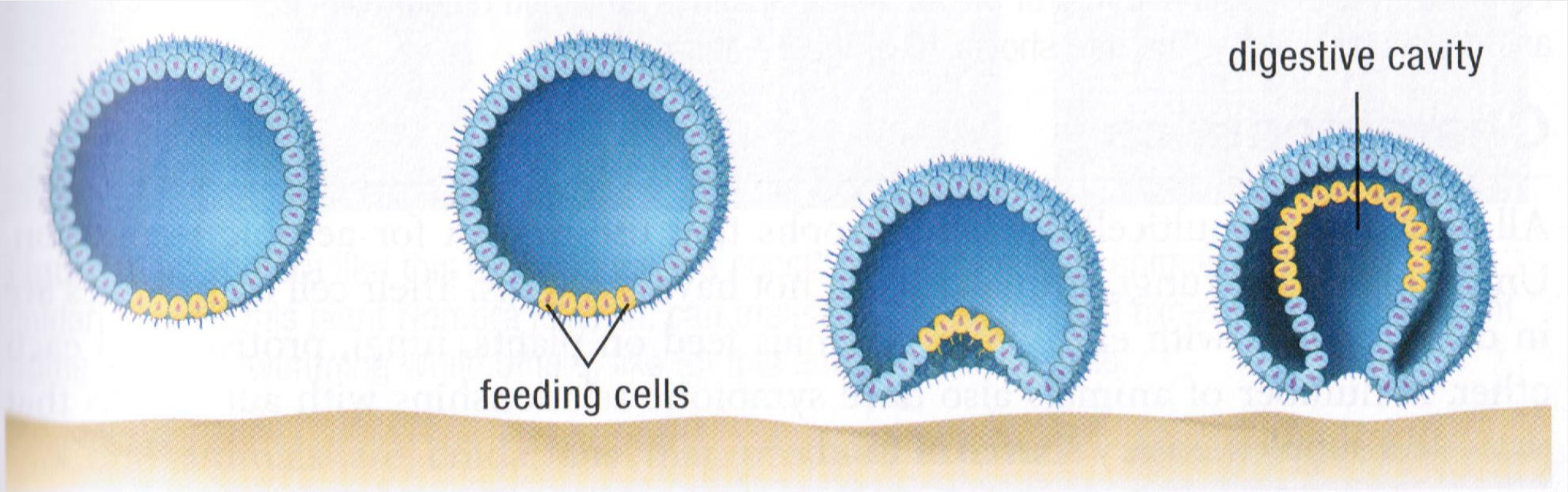
- Multicellular
- eukaryotic
- no cell wall and only a cell membrane
- Heterotrophic – can not make their own food
- Animals obtain there food from plants or other animals

- The Kingdom Animalia includes a wide variety of organisms that non-biologists don't often think of as "animals".
- When most people say the word "animal", they think of something with hair/fur, scales, or feathers.
- In reality, the majority of animals don't have any of those things; in fact, 95% of animals don't even have bones!
- Almost all of the animals that we commonly think of (e.g. mammals, birds, fish, amphibians & reptiles) belong to a single subgroup of one of **33 PHYLA**.
- Over half of animal phyla consist of various strange worms generally unknown to non-biologists.

- The FOSSIL RECORD of animals goes back about 700 MILLION YEARS.
- Like most animals today, those first animals LIVED IN THE SEA, and had very simple body plans.
- Living groups that resemble some of the first animals are the SPONGES, JELLYFISH & CORALS, AND WORMS.

The first animals evolved from an ancestor of choanoflagellata (flagellated Protist). A spherical colony may have indented to form a double layer of cells and a primitive gut.



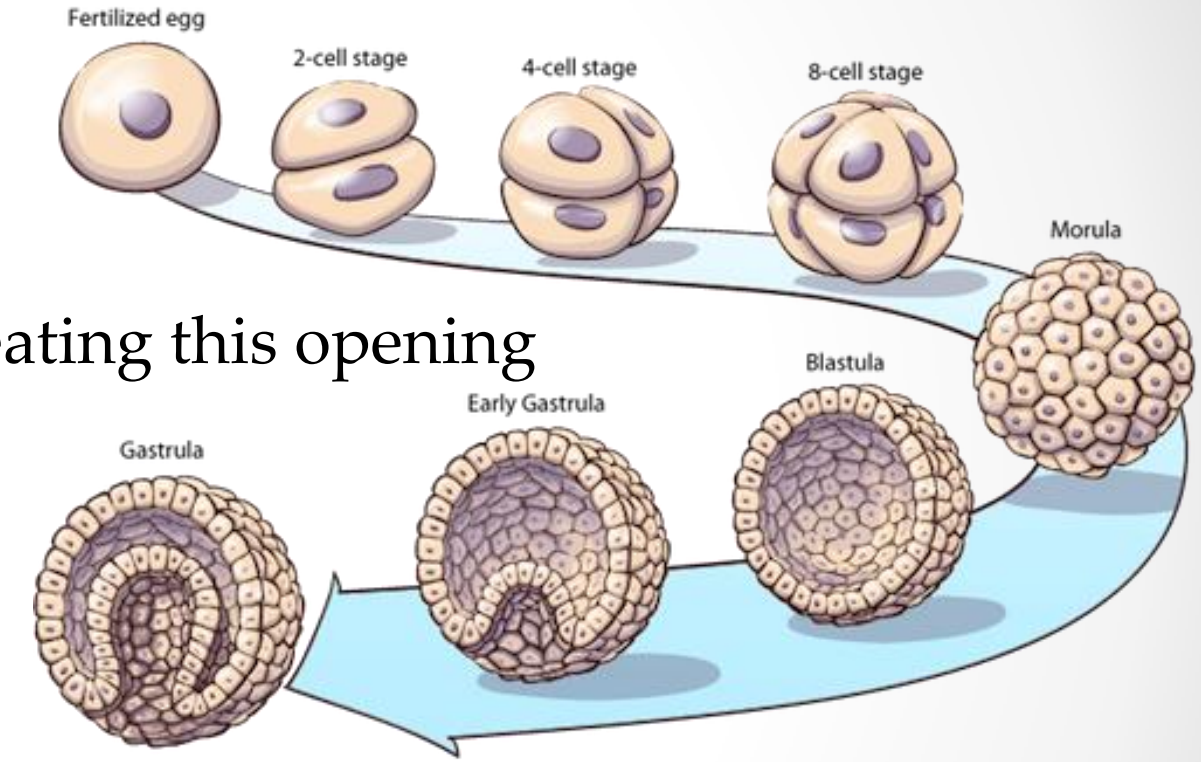


Scientists believe that animals evolved from colonial protists. The protists developed a hollow body cavity and specialized feeding cells. Over time, the colonies evolved into multicellular organisms with specialized tissues.

This development is still observed in the fetal development of animals:

Early Development:

- Zygote = fertilized egg
- Blastula = a hollow ball of cells
- Gastrula = the blastula folds in creating this opening



Cell Cleavage
Process by which the number of cells in a developing embryo is multiplied through cell division.

2 biggest groups

1. Vertebrates
   - Backbone (spine) or notochord
   - Notochord a flexible rod found in some chordates; in most modern chordates it is replaced by vertebrae during embryonic development.

2. Invertebrates
   - No backbone

Major characteristics used to classify animals:

1. BODY ORGANIZATION
   - Tissues, or organized tissues (organs)

2. Number of body layers
   - 2 (simpler) or 3 (more complex)
     - Endoderm → (innermost) lining of the gut
     - Mesoderm → (middle) circulatory, respiratory, excretory, muscular system
     - Ectoderm → (outermost) skin + nervous system
       → more complex species →feathers, scales, hair and nails

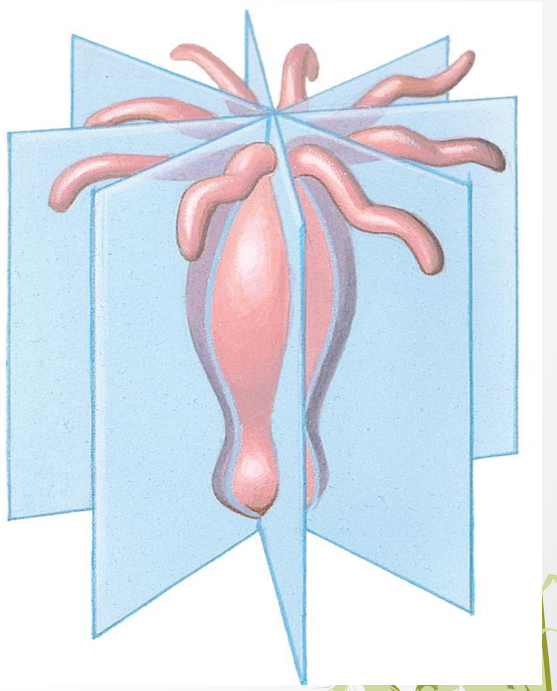
3. BODY SYMMETRY → it is the body plan of an animal or how its parts are arranged

a) Asymmetrical – no pattern

Example: Porifera (sponges)

b) Animals that display radial symmetry, such as hydra, jellyfish and starfish, are not well suit to rapid locomotion.

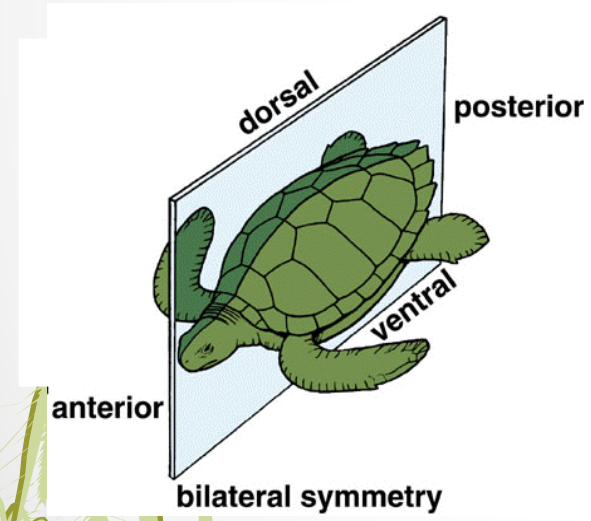
radial – slower since nothing leads

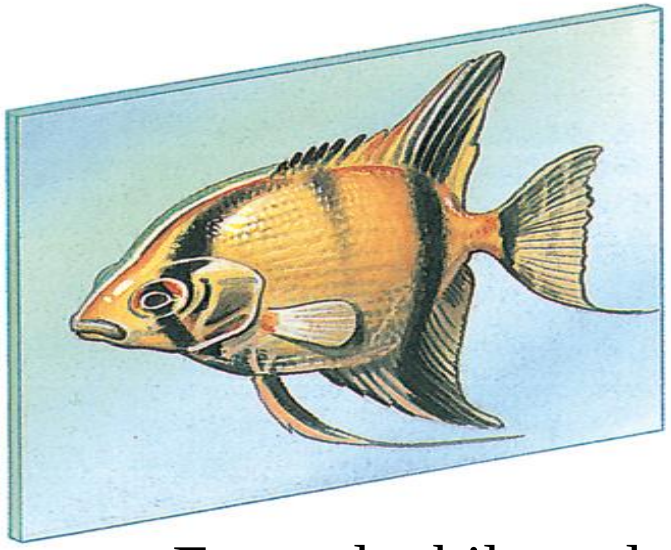


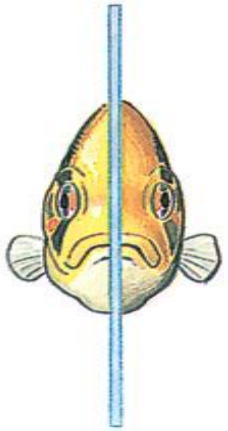
Example: hydra

- Bilateral – has a right and left side
  - faster, more efficient

One region enters environment first - Lead to development of a head with extra nerves. Allows for specialization (ie area of digestion, absorption etc)







Example: bilateral symmetry in fish

4. DIGESTIVE TRACT OR GUT → 1 or 2 openings

- Does the animal's gut have only one opening or does it have two openings: a mouth for food intake and an anus for expulsion of the body waste.

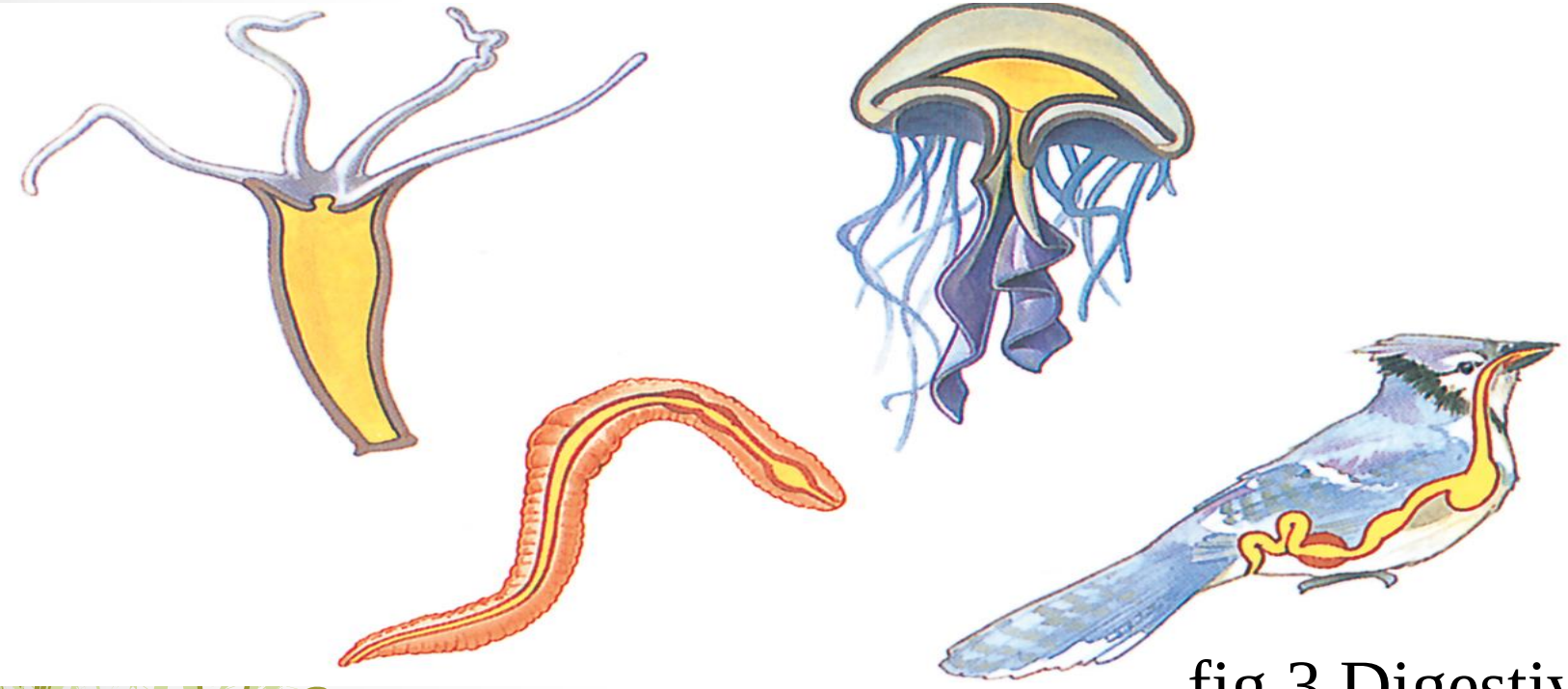


fig 3.Digestive System

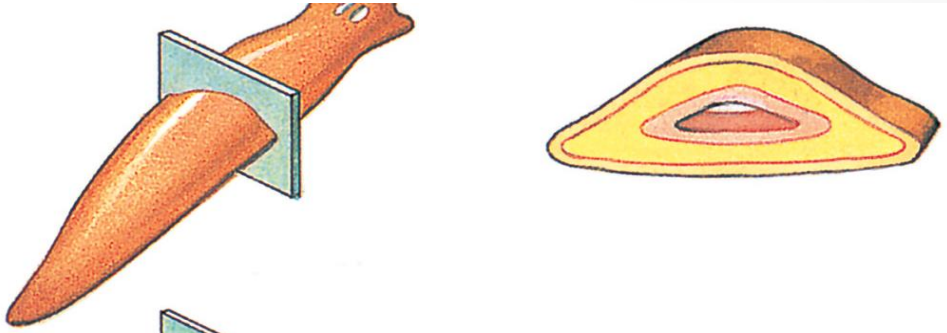
5. COELOM OR BODY CAVITY ◎ true, partial, absent

a) Acoelomate: no body cavity, body is semi-solid as all three tissues are in contact Ex. (Porifera - sponges)

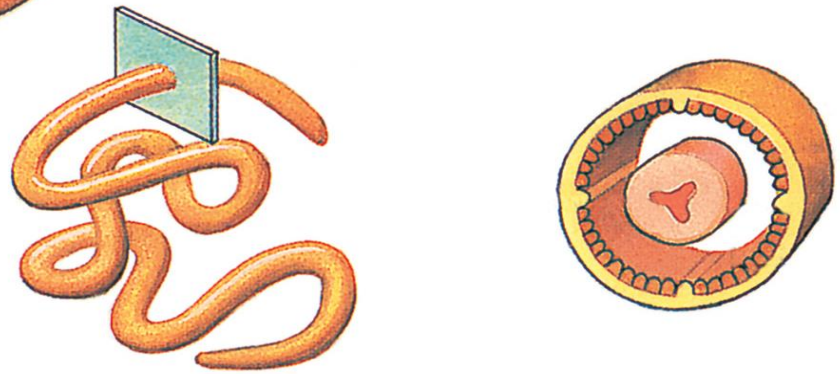
b) Pseudocoelomate: body cavity is partially lined, contains a fluid in which the various internal organs are suspended. Ex. Nematoda (roundworm)

c) Coelomate: the cavity within the body is fully lined and the internal organs are attached in an organized manner. Ex. Chordates, Arthropoda (insects, centipedes, scorpions, spiders, mites, ticks, crabs, lobsters and barnacles), etc.

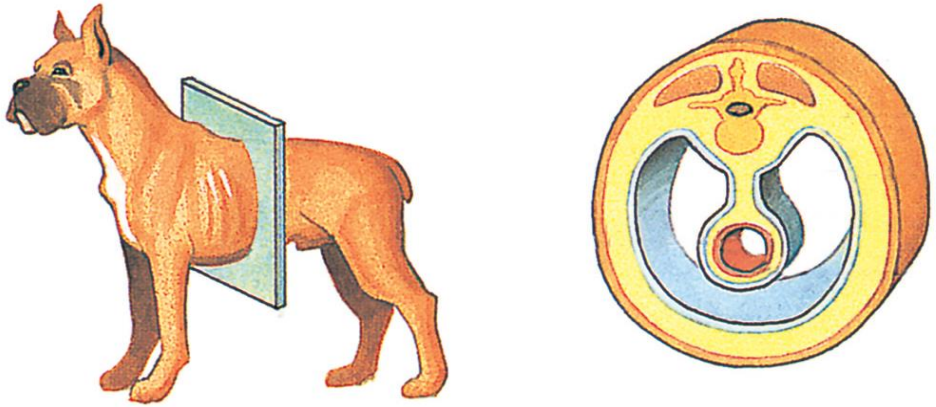
Acoelomate



Pseudocoelomate



Coelomate



Increase in size meant development of a coelom → room for organs to move and expand as well as help with exchange of gases (harder with larger organisms)

Most Important Phyla
1) Phylum Mollusca

- This phylum includes animals such as **CLAMS & OYSTERS** (about 10 000 species), **SNAILS & SLUGS** (at least 60 000 species) and **SQUID & OCTOPI** (about 650 species).
- The molluscs comprise the **2ND LARGEST** animal phylum and are mostly marine (though some live in fresh water and/or on land).
- Most are protected by **A HARD EXTERNAL SHELL** and include herbivores, carnivores, and parasites.

Phylum Arthropoda

- This phylum is **THE LARGEST** known living phylum of animals, with about 800 000 species having been identified by biologists (some estimate that their may be as many as 10 million or more in total).
- This phylum includes **CRUSTACEANS** (such as **CRABS & LOBSTERS**), **INSECTS** (such as **GRASSHOPPERS & BEETLES)** and **ARACHNIDS** (such as **SPIDERS & SCORPIONS**).
- The word "arthropoda" means "jointed leg" or "jointed foot".
- One trait which almost all of the members of this phylum have in common is that they possess a rigid **EXOSKELETON** made of **CHITIN** (the same material found in fungal cell walls). This rigid exoskeleton is what gives them their jointed appearance.

Phylum Echinodermata

- This phylum of about 6 000 species contains animals with an interesting mix of characteristics of both very simple and very complex animals.
- It is an entirely marine group (i.e. they all live in the ocean) and includes animals such as **SEA STARS, SEA URCHINS, SAND DOLLARS, & SEA CUCUMBERS**.
- Their name, which means "spiny skin", is derived from the presence of large spiny crystals in their skin.
- They are **RADIALLY SYMMETRICAL** as adults and include herbivores, carnivores, and scavengers.
- A feature that most echinoderms have in common is the presence of **TUBE FEET**; these constitute a mode of transportation unique amongst animals.

Phylum Chordata

- The phylum with which we are all likely the most familiar is our own, the phylum Chordata.
- While this group does include some animals which lack backbones **(INVERTEBRATES)**, most chordates do have **VERTEBRAE** and are thus classified within the **SUBPHYLUM VERTEBRATA**.
- While these animals appear to be the dominant form of life on land and in the water, remember that there are only about **45 000 SPECIES** of vertebrates compared to **MILLIONS** of species of invertebrates.
- This phylum includes **FISH, AMPHIBIANS, REPTILES, MAMMALS & BIRDS.**
- The reason that the phylum Chordata includes some invertebrates in addition to all vertebrates is because there are a select few invertebrates who possess, during at least a part of their lives, advanced characteristics in common with vertebrates.
- These include...
  - **A DORSAL NERVE CORD –** from which nerves branch to all parts of the body
  - **A NOTOCHORD –** a rod of cartilage which runs along the dorsal (or upper/back) length of the body. In most vertebrates, the notochord is almost to completely replaced by the vertebrae after the embryonic stage.